Neurotech business report

from medical technology to commercial products

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In This Issue

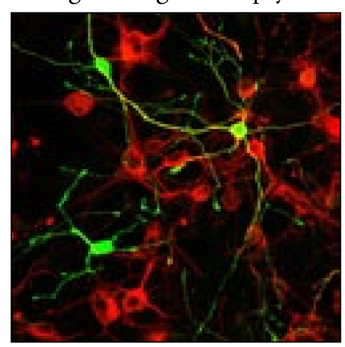
Departments

New Neuroimaging Tool Helps Locate Depression Circuit

by James Cavuoto, editor

A team of researchers at Stanford University has developed a new form of neuroimaging to help their quest to uncover the faulty brain circuits involved in depression. The technique, called voltage-sensitive dye imaging, allows intact brain circuits to be viewed in real time, enabling researchers to watch living neurons in action, across entire brain networks.

Writing in the July 6 issue of *Science Express*, the advance online publication of the journal *Science*, Karl Deisseroth, assistant professor of bioengineering and of psychiatry and behavioral sciences, along with Raag Airan, an MD/PhD student in Deisseroth's lab, described their effort to explain how a range of causes and treatments for depression converge.



Voltage-sensitive dye imaging process developed at Stanford helps researchers locate neuronal circuits involved with depression.

They found that in rats the differing mechanisms of depression and its treatment in the end appear to funnel through a single brain circuit. Changes in how the electrical signals spread through the circuit appear to be the cause of depression-related behavior, according to their study.

"I think this will help us make sense of how there can be so many different causes and treatments of depression," said Deisseroth. "It also helps us understand conceptually how something that seems as hard

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Task Force Addresses Access to New Neurotech Therapies

by James Cavuoto, editor

A newly organized task force representing clinicians, health service providers, payers, and neurotechnology vendors is seeking to expand the availability of neurotechnology devices for individuals with neurological and psychiatric disorders. The National Task Force on Consumer Access to Emerging Neurotechnologies held its inaugural meeting earlier this year and recently published a whitepaper specifically targeted to severe depression. Cyberonics, Inc., the Houston, TX manufacturer of vagus nerve stimulation systems, provided funding for the initial meeting but the group is currently seeking sponsorship from other neurotech device vendors.

The members of the new task force include several clinicians and academics involved with treatment-resistant depression, including Roger Haskett, a professor of psychiatry at University of Pittsburgh, Lawrence Cohen, a professor of pharmacotherapy at Washington State University, and Darin Dougherty from Massachusetts General Hos-

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Barrow Neurological Institute Performs Leading-Edge Research in Clinical Setting

by James Cavuoto, editor

Barrow Neurological Institute of St. Joseph's Hospital and Medical Center in Phoenix, AZ is internationally recognized as a leader in neurological research and patient care. Established in 1962, Barrow treats patients with a wide range of conditions, including brain and spinal tumors, cerebrovascular conditions, and neuromuscular disorders.

In addition to its clinical specialties, Barrow features several research laboratories. The Atkinson Pain Research Laboratory, led by Bud Craig, studies connections from the spinal cord to the brain that are involved in bodily "feelings." The main connection originates in a spinal region called lamina I. Quantitative analyses of lamina I spinothalamic neurons indicate that they serve as "labeled lines" that generate feelings of sharp pain, burning pain, warm, cool, itch, muscle ache, sensual touch, and other sensations related to the body's physiological condition.

Anatomic work in the laboratory shows that lamina I neurons project their axons first to autonomic spinal and homeostatic brainstem regions, then to a specific thalamocortical relay nucleus called VMpo, which is found only in primates and is greatly enlarged in humans. Craig's work also shows that stimulation of the vagus nerve causes activity within the same pathway. This finding supports the idea that pain is a reflection of the homeostatic processes in the brain that evolve to maintain the body's health.

Current work in the laboratory addresses the integration of pain, temperature, itch, and visceral representations within the insular cortex of the primate; the role of the medial thalamus and anterior cingulate cortex in the inhibition of pain by cooling; the association of deep dorsal horn cells with sensorimotor integration (considered for more than 30 years to be pain cells by others); the role of lamina I spinothalamic neurons in injury-induced sensitization (hyperalgesia); and the characterization of lamina I spinobulbar neurons involved in brainstem homeostatic mechanisms.

The Neural Physiology Laboratory, led by Jie Wu, studies the function and pharmacology of recombinant nicotinic acetylcholine receptors transfected into a cloned cell line and natively expressed nAChRs in neurons of the central nervous system using patch-clamp whole-cell and single-channel recordings. Wu's lab also looks at cellular and molecular mechanisms of epileptogenesis in different epilepsy animal models and epilepsy patient brain tissues, using electrophysiological techniques combined with cellular and molecular biological methods.

The Laboratory of Visual Neuroscience, headed up by Susana Martinez-Conde, investigates the aspects of the neural code that relate to visual perception. One of the ways the lab addresses this is by correlating the eye movements that occur during visual fixation with the spike trains that they provoke in single neurons. Since visual images fade when eye movements are absent, it makes sense that the patterns of neural firing that correlate best with fixational eye movements are important to conveying the visibility of a stimulus. The lab has found that bursts of spikes are better related to fixational eye movements than single spikes alone. This suggests that bursts of spikes are more reliable signals than are single spikes.

Calendar

Aug. 23-26 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Lyon France. Contact IEEE EMBS, embc07.ulster.ac.uk

Sep. 15-20 2007 Congress of Neurological Surgeons Annual Meeting, San Diego, CA, contact CNS, neurosurgeon.org

Sep. 26-27 BMES 2007, Los Angeles, CA. Contact Biomedical Engineering Society, http://bme.usc.edu/bmes2007.

Oct. 25-26 Neurotech Leaders Forum, Newport Beach, CA. Contact Neurotech Reports, 415 546 1259.

Nov. 3-7 Neuroscience 2007, San Diego, CA. Contact Society for Neuroscience, sfn.org.

Nov. 10-14 IFESS 2007, Philadelphia, PA. Contact IFESS, ifess.org.

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